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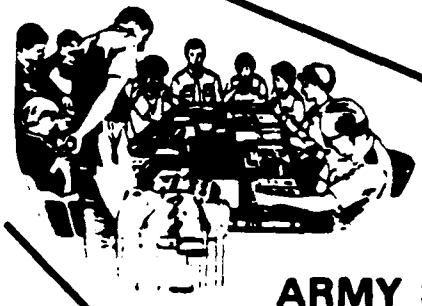
LEXSYS

Living Expert System



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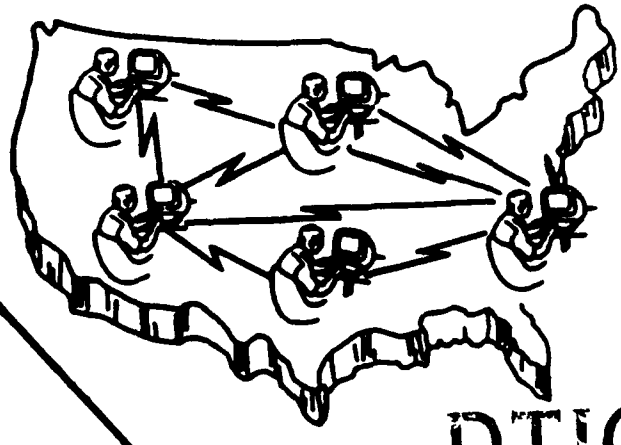

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USAWC MILITARY STUDIES PROGRAM PAPER

LIVING EXPERT SYSTEM

(LEXSYS)

A GROUP STUDY PROJECT

by

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ABSTRACT

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PREFACE

This continuation study of the Living Expert System (LEXSYS) has been prepared by the authors as a group effort in partial fulfillment of the graduation requirements for the U.S. Army War College Class of 1989. More importantly, the study is a commitment by a group of volunteers to accept the work accomplished by a study group during the Class of 1988 and expand upon the testing and evaluation of the concept.

In this study, he, him, or his represent both the masculine and feminine genders, unless otherwise stated.

Every individual that participated in the LEXSYS subnet and in the prototype operations analysis (PROTOLEX) contributed to this effort in a significant way. These individuals are acknowledged at Appendix D to this study.

Our project advisor, Colonel Richard A. Pomager, Jr., deserves special credit for his motivation, tenacity, and expert advise. Without his superb guidance, our efforts would have been less significant. We are deeply indebted to Colonel Pomager for his insight and his persistence in the refinement of LEXSYS.

Many individuals and agencies contributed to our final effort and are too numerous to mention here except for two

soldiers who are worthy of special mention. Lieutenant Colonels Ed Feige and Jim Cary, Directorate of Management, Office of the Chief of Staff, Department of the Army, contributed in a most noteworthy manner while accomplishing their highly visible and demanding daily responsibilities.

We trust, with our deepest aspirations, that designated staff within the Directorate of Management, Office of the Chief of Staff, Department of the Army, will carry on with inspiration, vigor, and resolve to implement LEXSYS on an Army-wide basis, as a decision support mechanism, for our senior military leadership. This study project, coupled with the documentation from the initial study group, provides a superb basis for proliferation of the concept. To fulfill our vision of teleconferencing, however, the Army must resource and support LEXSYS requirements within the Directorate of Management, prior to continued development and implementation.

INTRODUCTION

As a continuing development of the Living Expert System (LEXSYS), this Military Studies Program project was conducted by five students from the U.S. Army War College Class of 1989. The purpose of our study group was to build upon the LEXSYS concept as developed last year. Our methodology was to research the capability to build an expert data base, to interconnect data bases to share information, to retrieve information electronically, and to conduct audio-video teleconferencing. Further, the group's charter was to evaluate and provide recommendations on training for teleconferencing, cost analysis of the system, applicability to the joint staff, and teleconferencing software improvements.

Beyond this research effort, the group established and participated in an operational LEXSYS teleconferencing net to evaluate current system capabilities. Further, the study group conducted several prototype operations analyses (PROTOLEX) for the purpose of resolving issues for senior military leadership. The PROTOLEX demonstrated the capability of the system and will be used to promote LEXSYS as a decision support mechanism for senior military leaders.

The study effort has documented the benefits of Army teleconferencing and has provided the Directorate of Management, Office of the Chief of Staff, Department of the Army, as proponent, with validated prototype testing to provide the basis for follow-on Army-wide implementation of LEXSYS. Continued demonstration and use of the system by senior

officers and their staffs, as issue proponents, facilitators, or participants, are key to adaptation of the system throughout the Army.

PART I.

EXECUTIVE SUMMARY

THE LIVING EXPERT SYSTEM

PART I

EXECUTIVE SUMMARY

A. General. As articulated in Volume I, The Living Expert System (LEXSYS) is a decision support mechanism designed to augment an organization's current capability for issue recognition, problem solving, and issue resolution. LEXSYS captures the advantages of asynchronous computer teleconferencing by bringing together a broad base of subject matter experts from throughout the military services and governmental agencies. These individuals then participate in resolution of a problem or issue of concern to senior military leadership, while at their current location. LEXSYS is extremely cost effective in comparison to other methods of decision making such as conferences requiring the expenditure of TDY funds or seminars that use expensive video teleconferencing. In an era of austerity and budget reductions, this advantage of LEXSYS is paramount.

The LEXSYS system provides many advantages, as a decision support mechanism for the senior leader, beyond the significant economical aspect. First, the system brings together subject matter experts from across the military commands, staffs and agencies. Second, participants may contribute to issue resolution or problem solving at their current location and in consideration of their current duty and organizational priorities. Finally, LEXSYS is applicable to the joint staff

environment and will assist in networking other military commands, staffs and agencies in a joint effort for issue coordination and resolution.

The current hardware and software available at military installations and stations provide the essential equipment for participants to function within the LEXSYS system. However, additional refinements are needed in computer connectivity and OCONUS linkage to significantly enhance the system.

The keystone to a fully operational LEXSYS is the availability of a large data base of experts who willingly contribute to resolving issues placed on subnets. At the beginning of this effort, 113 experts in 16 broad subject areas and 124 various subject areas were available for LEXSYS issue resolution. There are now 534 subject matter experts registered for participation on LEXSYS, of which 64 are active participants. These individuals may be identified by name, broad subject area, or various subject area based on our configuration of the data base using the dBASE III Plus capability. Further, through our research and development, the Total Army Personnel Command (PERSCOM) data base may now be accessed by the LEXSYS proponent, the Directorate of Management, Office of the Chief of Staff, Department of the Army, to acquire additional experts. Accordingly, a significant talent data bank of experts exists and may be expanded to resolve issues for senior military leadership.

Three prototype operational analyses (PROTOLEX) were accomplished to research and evaluate the current status of LEXSYS, to demonstrate the practicality and manageability of the system, and to further evaluate the LEXSYS concept. Three separate, discrete LEXSYS subnets were activated to resolve issues and one item was discussed on the LEXSYS subnet to provide "expert" advise to the Issue Facilitator. As this report was being finalized, the team received two requests from field commands to establish PROTOLEX subnets. Both nets were activated and projected to remain operational until 1 September 1989.

B. Conclusions. The Living Expert System has tremendous potential as a decision support mechanism for the senior level military decision maker. The advantages of cost effectiveness, a large talent data bank, asynchronous dialogue, home station participation and joint applicability are indicative of a system whose maturity and time for proliferation throughout the military services is near.

Conclusively, civilian industry is leading the way in proving that the teleconferencing concept has legitimacy and validity. Their use of teleconferencing has proven the increased cost effectiveness and incremental managerial capability of the concept. As a result, commercial industry will continue to develop this exceptional system. Accordingly, the industry has provided a system foundation and evolving

technology for the military services to fully expand the prototype testing of LEXSYS and to implement the system throughout the military.

Major General Howard Graves, Commandant, U.S. Army War College, stated on 18 November 1988, that LEXSYS may well be an idea before its time and that the task at hand was to evaluate, not prove, the concept. Conclusively, Volumes IV, V, VI, and VII document the research and analysis conducted for the LEXSYS system and establish the practicality and manageability of the system. We believe that LEXSYS is nearing maturity and the time for proliferation throughout the Army is within view.

C. Recommendations. 1. Expand prototype testing of LEXSYS to Army Major Commands (MACOM) and then to joint service commands.

The prototype operations analysis (PROTOLEX) conducted during this academic year revealed that the system provides a very useful mechanism for senior military leaders to resolve issues. However, before proliferation of the concept, MACOM commanders should use the system, in a prototype mode, to further refine connectivity issues and to enhance data base networking potential. Also, MACOM commanders' participation is essential for the promotion of LEXSYS.

2. Continue to provide the Directorate of Management, Office of the Chief of Staff, Department of the Army, as the LEXSYS proponent, with a principle staff officer and operational staff dedicated to the LEXSYS system.

Maintenance of the talent data bank of experts, resolution of connectivity issues, coordination with the PERSCOM data base managers, and providing for technical guidance to MACOMs, are resource intensive and require a dedicated staff. These capabilities and resources, if not currently available within the Directorate, would be a limiting factor for further refinement of the concept and proliferation of the system.

3. Require Senior Service College level schools to administer the Baseline Assessment Survey (BAS II) to all students upon arrival.

Registering new students on LEXSYS upon arrival at academic institutions of higher military learning will enhance the talent data bank and significantly expand its population. Further, during the course of instruction, students should be familiarized with teleconferencing and encouraged to utilize its applications during the academic year. Upon graduation, students should be conversant with LEXSYS, appreciative of the potential capability of teleconferencing and motivated to participate with the system after graduation.

4. Pursue networking of data bases in CONUS and computer connectivity for enhancement of OCONUS participants' communications capability.

The full potential of LEXSYS can be reached with improved capability to interconnect numerous data bases by networking computers to share information and experts. Improvements in the connectivity of computers between CONUS and OCONUS users will further enhance the LEXSYS system by increasing

communications capability among participants. Further, technological improvements for current connectivity will increase participation as the system becomes more user friendly.

5. Incorporate changes to the teleconferencing software, Confer II, to enhance participant use of the LEXSYS.

System improvements concerning the editor function "on line" help files, a wrap-around function and improved user manuals are discussed in Part II, Section I, Confer Software, this volume.

PART II.

LIVING EXPERT CONCEPT

THE LIVING EXPERT SYSTEM

PART II

LIVING EXPERT CONCEPT

A. Current Status of LEXSYS. Recognition of the need for a Living Expert System (LEXSYS) has been germinating in the minds of many people for several years.[1] Indeed, the study group from the U.S. Army War College Class of '88 (AWC '88) wrote the concept for LEXSYS at the direction of the Vice Chief of Staff of the Army. Further, the group fully analyzed the potential for this system as an enhanced decision making capability for senior military leaders.

The current study group from U.S. Army War College Class of 1989 (AWC '89) set out to prove the practicality and manageability of the system and to demonstrate its decision support capability to senior level decision makers. This group started where Volumes I, II, and III of LEXSYS concluded in May of 1988. Currently, the expert data base consists of a talent data bank of 534 individuals who are primarily senior service school students, staff and faculty, and other senior leaders from throughout the services. This data base was developed by creating a new survey instrument (BAS II) which streamlined the previous Baseline Assessment Survey (BAS) method of identifying experts. Registrants for the LEXSYS expert data base were acquired from student populations at AWC '88 and '89, AWC Corresponding Studies Courses '89, National War College '89 and the Industrial College of the Armed Forces '89. Senior

officers serving on major command staffs and in other senior leadership positions also participated on LEXSYS. Further, a methodology has been developed to identify these individuals by name, by broad subject area, or by various subject area, within the expert data base. The result is a talent data bank, or a data base of experts, that is easily accessible and manageable. Expansion capability of this data was also tested by identifying procedures and designing access nodes for utilization of the Total Army Personnel Command (PERSCOM) data bases. Resultantly, individuals identified as possessing required "expertise" from the PERSCOM data base can be added to the LEXSYS data base. This expansion capability is of significant importance when the existing registry of experts is deemed inadequate to address specific issues on a prototype operations analysis (PROTOLEX).

A revised training package was developed for use by staff and faculty at the Army War College and was used successfully to train numerous students on the WYSE system, using "TERM" software. A sample training package is at Volume V, Appendix F. The Directorate of Management, Office of the Chief of Staff, Department of the Army, has committed to providing participants on the LEXSYS subnet with teleconferencing software for use at the work place or at home on a personal computer.[2] Further, a substantive review of existing training packages supported the coach and pupil methodology for learning teleconferencing as most effective.

Also, proposals for the improvement of Confer II software, basic software for Army FORUM and LEXSYS, have been provided to the developer to enhance use of the system. These proposals are discussed in this Volume, Part II, Section I, Confer II Software.

As an alternative to conferences and seminars conducted with TDY funds, LEXSYS is very effective. As the system is improved and the costs of travel rise, the cost effectiveness will be even greater.[3] The discussion of cost analysis is a significant factor in the promotion of LEXSYS as senior managers approach an era of austere budgets.

The LEXSYS system, further proven through significant additional research and demonstration of its capabilities, is nearing maturity for proliferation throughout the Army and for use by other military services as well. Additional prototype testing and analysis should be conducted to further enhance the system and to promote the concept among the senior leadership. The Directorate of Management, Office of the Chief of Staff, Department of the Army, as proponent, should now take the lead to sustain this development and provide for the implementation of LEXSYS on a world-wide basis.

Writing for an article on teleconferencing in the Spring 1971 issue of Parameters, (then) Lieutenant Colonel Mike Malone quoted Samuel Johnson, who in 1775 said: "Knowledge is of two kinds; we know the subject ourselves, or we know where we can

find information about it.".[4] LEXSYS can show senior leaders where to find information essential to effective decision making.

B. EXPERT DATABASE. An expert data base is the lifeblood of any decision support mechanism such as LEXSYS. The data base is designed to provide the capability to identify individuals from throughout the Department of Defense with expertise in one or more critical subject areas via a simple query process. The expert data base will permit senior leaders and their staff officers to identify individuals with specific expertise to voluntarily participate in the problem solving process. The initial intent of the LEXSYS concept was to provide a mechanism to resolve Army issues; however, the data base has been expanded to include experts from other military services and governmental agencies allowing for resolution of issues in the joint arena.

Data acquired from the Baseline Assessment Surveys (BAS) administered to the AWC '89 class (Volume V, Appendix H) was used to build the initial expert data base. In an effort to demonstrate the use of a common data base management program, dBASE III PLUS was used to construct the prototype data base for LEXSYS. The data base fields were designed to contain the name, rank and branch of service on each individual expert. Additional fields were constructed to accept information concerning the levels of expertise for the various subject area categories. Expertise levels are numerically expressed and

range from the number 5 to number 1. Number 5 is the top end of the scale and represents a subject matter expert, while number 1 is at the low point of the expert scale and represents a novice. A complete explanation of levels of expertise and subject categories is contained in Volume V, Appendix H. The information obtained from the BAS was entered into dBASE III PLUS and the present configuration of the expert data base allows the user to search the fields of the data base for a specific subject area, broad subject area or last name. Instructions for users of the expert data base are contained in Volume V, Appendix H, Tab E.

The CONFER II teleconferencing system contains a data base management capability that is designed for large data bases with 25,000 or more records. This capability currently exceeds the LEXSYS requirement; however, the CONFER II data base management system may be used with LEXSYS as the system is expanded for Army-wide use. Access to CONFER II does require on-line communications and a MODEM equipped terminal resulting in additional telecommunications costs.

Existing data bases maintained by PERSCOM provide an additional capability for identifying subject matter experts. LEXSYS Issue Facilitators may request the identification of potential subject matter experts from the PERSCOM data base via coordination with the Directorate of Management, Office of the Chief of Staff, Department of Army. Use of the PERSCOM data base was tested through coordination with Dr. James Kasprzak, Deputy Director, Plans & Programs Directorate, Personal

Information Systems Command, by transmitting a plain text list of qualifiers via facsimile that, if met, would identify experts on Low Intensity Conflict. The LEXSYS team also conducted telephonic interviews with prospective participants to validate their background and experience. This method of accessing the PERSCOM data base to identify experts was successful and provided for a potential expansion of the LEXSYS expert data base.

C. DATA BASE NETWORKING AND RETRIEVAL. Users of LEXSYS are currently limited to data bases resident within Army ENTRY, yet the system can be significantly enhanced by establishing external communications connectivity with other data bases. Ideally, LEXSYS users should possess the capability to search for "experts" in a specific functional area or retrieve information from other data bases located throughout the Department of Defense (DOD). It should be noted that the capability to access and retrieve information represents an extraordinary enhancement to LEXSYS and other subnets under the auspices of the Army FORUM Office at HQDA.

First, a requirement exists to identify true "experts" in a particular field or subject area. The LEXSYS expert data base (Part II, Section B, this Volume) identifies a portion of this capability; however, only a very small percentage of the actual expert population in any given field is identified. For example, access to the Defense Data Network (DDN) offers improved communications as well as access to all DDN users.

Currently, access to Army LEXSYS can be accomplished through DDN, but entry into the DDN is not possible from Army LEXSYS or any other subnet. Consequently, the LEXSYS user must also be an authorized DDN user which can only be accomplished via a DDN mailbox application through the local Director of Information Management. Planned improvements to Army ENTRY include a more efficient interface with the DDN and an improved information exchange and communications connectivity for participants on all subnets.

There are several other data base networking options that can provide LEXSYS users with the ability to review and retrieve information and to identify experts. The task for acquiring this information is similar to using a library automated filing system, but the procedure is accomplished on a remote basis via a communications link to a computer based library. CompuServe Information Service, for example, provides this capability in the commercial sector and offers a multitude of informational services on a worldwide basis.[5] A similar capability would greatly enhance Army LEXSYS users in meeting the requirement to search, read and retrieve information contained in reports, articles and staff papers. Similarly, a communications link to data bases such as the Pentagon Decision Support System (DSS) would facilitate access to information maintained by those organizations and staff sections supported by the DSS. Several organizations currently on the Pentagon DSS are Information Systems Command; Training and Doctrine Command; Total Army Personnel Command; Deputy Chief of Staff

for Logistics, HQDA; and the Directorate of Management, Office of the Chief of Staff, Department of the Army. The Defense Technical Information Center (DTIC), which is also located in the Pentagon, is an excellent example of a computer based library. The DTIC, however, contains classified documents and cannot be accessed from an external source, such as LEXSYS, due to security requirements. Modification of the DTIC to protect the security of classified information, however, would provide connectivity with the unclassified portion of this data base and be of benefit to LEXSYS.

The final point of discussion on interconnecting data bases concerns networking with systems that are similar in purpose to LEXSYS. For example, the National Science Center, under construction at Fort Gordon, Georgia, is sponsoring a program titled the National Electronic Education Distribution System (NEEDS). The ultimate goal of NEEDS is to provide users with technical electronics and automation information, primarily for educational purposes. The system will eventually contain forums, bulletin boards, libraries and access to experts.[6] NEEDS will be fully operational within two years and it represents another potential source of information for LEXSYS users that can best be exploited through the communications networking of data bases.

The capability for LEXSYS users to electronically network with computer data bases will provide for increased use of information and subject matter experts. Access to other data bases such as the DDN Users' Directory can provide LEXSYS Issue

Facilitators with another source to identify potential experts. Data bases like DSS, DTIC and NEEDS offer the capability to search and retrieve information on a particular subject and may well provide a limited capability to identify experts.

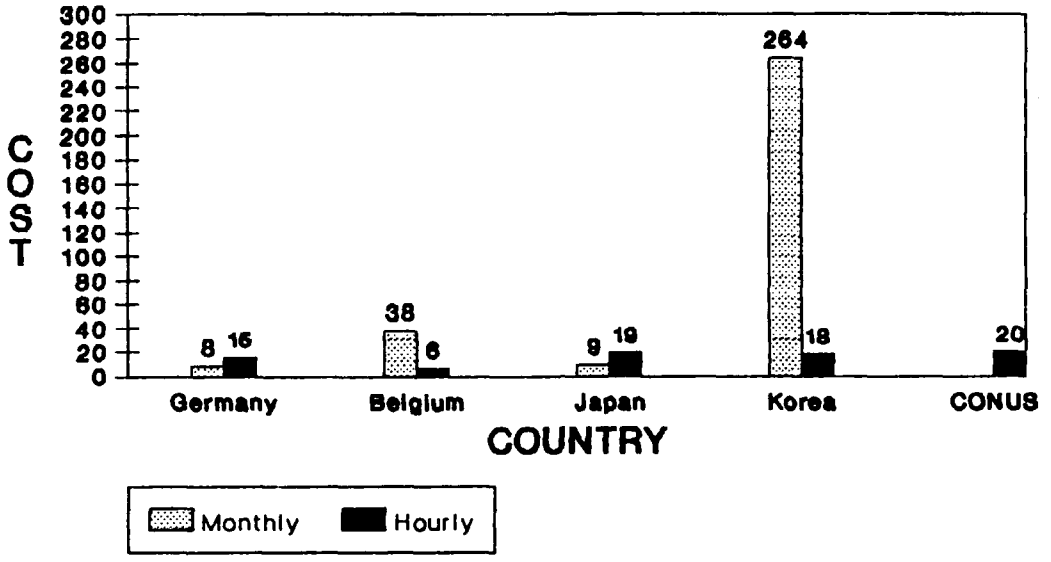
D. OCONUS Connectivity. Communications support and computer connectivity for LEXSYS users Outside the Continental United States (OCONUS) is essential for the continued demonstration and future proliferation of LEXSYS. Current system deficiencies and limited capability precludes OCONUS users from fully participating in LEXSYS. Of the current 64 LEXSYS active participants only 4 are stationed OCONUS; two in Hawaii and one each in Korea and Germany.

There are three basic communications options for the OCONUS participant to communicate with LEXSYS: commercial communications, military automatic voice network (AUTOVON), and Defense Data Network (DDN).

The use of commercial communications is extremely expensive compared to military communications options. In some cases, the initial costs are low; however, the actual use cost tends to rise rapidly. In other cases, the initial costs are high, while use costs are low. Examples of costs associated with the OCONUS commercial communications system, TELENET, are compared with CONUS costs in figure D-1:

TELENET OCONUS CHARGES

($US approx. Where shown, both monthly and hourly costs must be paid.)



1. Charges vary with distance and time.
2. Monthly cost NA in CONUS.

Figure D-1

Although commercial circuits are expensive, minimal line noise and loss of data enhance its reliability.

AUTOVON offers the least expensive access to LEXSYS from overseas areas, although these circuits do not provide a quality signal for the transfer of computer data from one modem to another. Additionally, AUTOVON users are subject to preemption due to higher precedence calls that disrupt the LEXSYS process. Preemption causes a disruption of the signal, a loss of information presented, and temporary termination of access to the circuit.

Current US Army Europe (USAREUR)/US European Command (USEUCOM) policy limits data transmissions via the European Telephone System (ETS) to other than normal duty hours.[7] Although this policy prevents data from saturating an already overused telephone system and keeps the telephone system open for official voice communications, it causes considerable inconvenience to the user.

The final communications option for OCONUS participants using LEXSYS involves the DDN. This network provides common user, long haul data communications utilizing packet switching technology. DDN is composed of a number of packet switched nodes interconnected by interswitched trunks and connected to user computers and terminals by various interface devices.

There are four separate DDN's that provide service on a world-wide basis. Military Network (MILNET) supports unclassified DOD users; DOD Integrated Services Network-1 (DISNET-1) supports secret DOD users; DISNET-2 supports top secret DOD users; and DISNET-3 supports TS SCI DDD users. Since LEXSYS is structured in an unclassified environment, DDN MILNET is the sole DDN that can be employed with LEXSYS.

DDN is a Defense Communications Agency (DCA) managed program in the implementation stages. MILNET, the largest DDN, currently has 34 MILNET packet switching nodes in Europe, and the MILNET is approaching its planned limit of 253 packet switching nodes world-wide. Daily, hundreds of users access the system primarily for use of the electronic mail capability.

Several challenges exist for OCONUS participants to use DDN for interconnection to LEXSYS. USAREUR/USEUCOM policy restricts the use of interswitch trunks on the ETS for connection to dial-up modems during duty hours. Further, a growing Telecommunications Service Request backlog of data users requesting DDN service exists. Without DDN, LEXSYS participants must use commercial packet switching systems, dedicated leased circuits, or dial up to distant packet switching nodes after normal duty hours. All of these communications options are expensive and inconvenient. Additionally, reduced funding exists for DDN use because of mandated DOD budget constraints. As a result, the number of users connected to DDN is limited. However, DCA and the US Army Information Systems Command are pursuing the acquisition of new nodes to increase DDN availability to customers. Conclusively, DDN is the most cost effective, reliable and responsive communications system interconnecting OCONUS and CONUS participants.[8]

E. Training Requirements. The training concept developed by last year's group and documented in Volume I, Living Expert System, established a baseline of competency among LEXSYS participants.[9] This concept was designed to enable the senior leader, the Issue Facilitator, and the system participant to use the teleconferencing system as an effective decision making tool.[10]

Effective training for prospective participants on the LEXSYS system is essential, particularly for Issue Facilitators and participants who are not computer literate. Accordingly, the research and documentation effort of last year's study group was continued to reach conclusions on the most effective and current computer teleconferencing training applications.

The ideal training scenario is with coach and pupil in a "hands-on" environment. During the scope of this project, 18 senior service school students were trained by members of the LEXSYS team using this method. Essential instructions were provided to each participant via a training package, which is displayed at Volume V, Appendix F, Teleconferencing Training. Students were provided a 10 minute overview of the Army FORUM teleconferencing system followed by a page-by-page review of the "take-away" training package. Then, each student was provided a coach who talked the student through two teleconferencing sessions and observed while the student accomplished the third session with minimal coaching assistance. A follow-up session was accomplished one week later to enhance the training effort. Failure to follow-up and provide assistance could cause despondency and lead to termination of the learning experience and the practical use of teleconferencing. In fact, Mervin Mullins, District Engineer Command, Alaska, estimates that at least 20% of the participants become inactive within two months of initial teleconferencing learning.[11] Our experience on Army Forum Net was significantly higher, and estimated at 35% inactivity.[12]

Finally, LEXSYS trainers stimulated students to use teleconferencing by sending messages and instructions over the LEXSYS net for the next two weeks. We found that trainers must follow-up with new participants or the demands of the primary duty will take precedence over LEXSYS. New participants should also be encouraged to establish a routine to use LEXSYS on a scheduled basis throughout the work week.

The second most effective training method is via programmed texts and reference manuals. The Beginner's Guide to Confer II is an excellent reference manual to learn teleconferencing via the self-help method.[13] This method of learning teleconferencing is especially effective for younger students, many of whom are computer literate or have basic knowledge of computers, teleconferencing or word processing systems. This method is also very useful for individuals in isolated locations where no coaches are available.

Disk-based tutorials also provide excellent teleconferencing training for individuals that have a basic familiarity with computers. In fact, the Confer II software has a training program titled "FORUMTNG" that can be accessed by entering: "J ARMY:FORUMTNG," once on the teleconferencing network. A demonstration of a training session with the Confer II software is provided in Volume V, Appendix G, Forum Net Training Demonstration.

Issue Facilitators require orientation and training beyond the information and experience provided to participants. Again, the coach and pupil technique is the preferred procedure

for orienting and training facilitators. A senior officer who has previously facilitated several teleconferencing sessions to successful conclusion is in the best position to be the coach. He can relate the unique requirements for problem identification, determination of the issue scope, formatting the courses of action and specifying the desired results of the issue being resolved. Additionally, the coach should review the dynamics of the group process with the prospective facilitator. It is essential to know when to summarize, consolidate, or terminate an item when an issue is being worked on a subnet. Further, the new facilitator must be able to change the direction of a teleconferencing group when they stray from the basic issue. These techniques are, however, very similar to directing a large conference, in person.

For LEXSYS to be implemented Army-wide, all graduating students from senior service schools should be offered the opportunity to become conversant with Army teleconferencing. Training for computer teleconferencing and subsequent registration with the talent data base at these service schools is essential. The senior leadership of our Army should also be trained to use Army teleconferencing so that the full potential of the LEXSYS can be realized. Issuing each participant communications software would provide the additional incentive to become involved in Army teleconferencing and further the expansion of LEXSYS.

F. Cost Analysis. The purpose for conducting a cost analysis for a LEXSYS PROTOLEX was to determine actual cost data for the LEXSYS concept of asynchronous computer teleconferencing. We compared that data with cost information for alternative problem solving forums, such as conferences or meetings requiring expenditure of TDY funds.

Conclusively, we determined that LEXSYS provides the following advantages:

a. Enhances both the quantity and quality of subject matter experts available to solve or work a problem or issue.

b. Provides highly qualified experts for a study group.

c. Reduces funding and availability considerations for potential participants.

d. Utilizes an asynchronous system that allows participant flexibility to design the study effort in consideration of personal schedules.

e. Eliminates schedule adjustments often required with face-to-face conferences.

f. Allows experts to readily share their knowledge which encourages and facilitates this type of decision making mechanism.

g. Provides for quicker and easier access to expert knowledge and participant insights.

h. Reduces the need to bring study groups/working groups together at a central location resulting in substantial savings of Temporary Duty (TDY) funds and a reduction of lost travel time.

As each PROTOLEX was activated, the LEXSYS team Net Organizer permitted "experts" onto the LEXSYS net for orientation and familiarity with the system and then the participants were permitted onto the particular subnet requiring their expertise.

Intangibles of using the LEXSYS system cannot be quantified but must be considered in the final cost analysis. Intangibles such as: time involved in preparing for a TDY trip, actual travel time and the separation from normal duties and family life, are avoided by using LEXSYS as the conference medium.

LEXSYS PROTOLEX costs were compared to the cost of a conference or meeting requiring TDY funds to determine the cost effectiveness of using LEXSYS as a problem solving tool. LEXSYS was evaluated in lieu of, or as an enhancement to, conferences or meetings requiring the expenditure of TDY funds. A detailed cost analysis is provided at Appendix B, this volume.

It is significant to note that during an era of budget constraints, senior level military leaders enthusiastically accept cost reduction initiatives that do not cause a corresponding reduction in effectiveness. Accordingly, we view the LEXSYS with that same enthusiasm.

G. Audio & Video Teleconferencing. A LEXSYS subnet operation can be enhanced by use of audio and video teleconferencing as an adjunct to asynchronous computer teleconferencing that

provides a decision support mechanism for senior military leadership. Although video teleconferencing is not a new technology, its use within the military has been marginal because of the significant cost and the limited availability of video facilities.

The main video teleconferencing systems within the Army are the Department of the Army (DA) system and the US Army Materiel Command (AMC) system. The DA video teleconferencing system interconnects the staff and agencies located within the Pentagon with HQ, AMC; HQ, Training and Doctrine Command; HQ, Forces Command; HQ, US Army Health Services Command; HQ, US Army Information System Command; and the U.S. Army War College. The AMC system interconnects its subordinate major headquarters and provides video linkage with key commanders and staff members. TRADOC is now installing an extensive video teleconferencing system and is scheduled to have four conferencing facilities operational within the next 14 months.[14] A video facility at Fort Leavenworth, Kansas will be completed and operational in the near future and will provide video linkage with other Army facilities.

Commercial video teleconferencing facilities such as the AT&T Picture Phone and systems owned and operated by hotel chains are state-of-the art, readily available, and currently in use. However, these commercial systems, located in metropolitan areas such as New York, Chicago, Washington, and Los Angeles, are used primarily for civilian commercial

purposes. An interface with military facilities is not available and no developmental efforts are underway to provide for an interface.

The cost for producing a television-quality video teleconference is at least 5 to 10 times as expensive as audio teleconferencing over comparable distances.[15] Video is a wide-band communications medium that transmits a vast amount of information and requires use of a large signal carrier. Resultantly, the current costs for conducting a video teleconference far exceeds costs of audio or computer teleconferencing. With increasing technologies, however, we believe that costs should drop substantially.

Video teleconferencing is a televised group-to-group medium. However, while video systems attempt to mimic face-to-face meetings, basic differences between an electronic meeting and a meeting in person cannot be eliminated. Many individuals are uncomfortable "on camera," and their performance is inhibited by this uneasiness. Associations with television and movies probably create this discomfort, which is fueled by the studio atmosphere of the video teleconferencing system.[16] Teleconferencing spontaneity will become easier once participants are exposed to media protocols and conferees become more at ease with the various techniques required of video teleconferencing.

Video teleconferencing assists distant participants in non-verbal communications, but an image on a television monitor is different from face-to-face communications and participants

must adjust to this difference.[17] Video teleconferencing allows users to conduct meetings and classes, and is extremely effective when an in-person face-to-face meeting cannot be arranged.

Video teleconferencing in conjunction with LEXSYS, can be used to set up and coordinate an issue, to receive direction from a senior leader on an issue, or to assist in the summation of an issue. Video teleconferencing may also be used to brief a CINC or commander on comments or data received while conducting asynchronous computer teleconferencing. Thus, video teleconferencing is a natural adjunct to a LEXSYS subnet operation.

Significant challenges are associated with utilizing video teleconferencing, however, and the limited number of military video facilities and nodes available for teleconferencing sessions is the greatest of these challenges. For example, the DA system can interconnect with the six other locations plus only one facility from another system. Additionally, extensive coordination and lead time is necessary to utilize a military video teleconferencing system.

Video teleconferencing sessions offer the following benefits:

a. Provide capability to communicate directly with conference members.

b. Eliminate nonproductive travel time.

c. Provide for an instant history file via TV recording of the video conference.

d. Provide a valuable forum for complex communications situations.[18]

Video teleconferencing matches the quality of face-to-face meetings better than any other teleconferencing operation, which significantly increases its effectiveness. Participants are able to see how the other participants are reacting: interested, complacent, frustrated, or distracted. Further, video teleconferencing allows the group to present creative graphic materials more effectively. Use of video encourages rapid decision making since participants can evaluate how other participants are reacting to comprehending the problem and working towards a solution.

Audio teleconferencing is defined as a meeting held with three or more persons via the telephone. AT&T and the military communications services have offered "conference calls" for many years and these calls have been effective in acquiring limited coordination or resolving minor issues. Most military telephone operators can set up audio teleconference calls with minimal lead-time, coordination or application of momentary resources. Thus, the audio teleconference call is a simple extension of the common telephone.

The costs of audio teleconferencing are low when compared to video teleconferencing and audio is, therefore, used more extensively. Audio uses inexpensive telephone lines, although costs increase as more participants join the conference.

Acoustical conditions in the audio teleconferencing environment have plagued sessions with four or more participants. Background noise such as shuffling of papers, printing or typing operations, and coughing or sneezing are disruptive to participants. While these acoustical problems can be annoying, they are manageable and participants can be disciplined to establish and maintain a positive audio teleconferencing environment. However, the more participants in a conference, the higher the potential for background noise and the greater the disruption to users.

Perhaps the greatest challenge to the users of audio teleconferencing is the order of speaking. With face-to-face meetings, visual signals usually assist participants in determining who speaks, in what order, and when. Gestures and motions indicate when someone is almost finished speaking and assist others in identifying who is waiting to speak next. In audio teleconferencing, however, there are no such visual cues and establishing the order of speaking--and sometimes even identifying who is speaking--are basic problems.[19] The individual in control of the conference call, therefore, must conduct the session in a very structured manner to overcome this problem.

Audio teleconferencing sessions offer the following benefits:

a. Provide satisfactory communications for tasks which stress information exchange and limited problem solving.

b. Enhance meetings that emphasize information gathering and exchange of ideas.

c. Permit rapid communication without travel.

Compared to video, audio teleconferencing is an intermediate technology. The equipment is simpler to use than video and is less costly. At the same time, audio teleconferencing is adequate for many meeting tasks that don't require non-verbal feedback in resolving difficult, lengthy issues. Audio conferencing may require more discipline of its users since participants must remain cognizant of who is speaking and what is being said.[20]

Audio, like video teleconferencing, will enhance the utilization of LEXSYS by providing far greater communication depth and increased use of group dynamics in resolving issues and solving problems for senior military leaders.

H. Joint Staff Applicability. The concept of asynchronous staff work, conducted within the normal duty environment is appealing to the Joint Staff as well as the Army Staff. Of the 64 active participants on the LEXSYS subnet and PROTOLEX subnets, 15 were senior officers and civilian personnel serving on other than Army staffs. Accordingly, the LEXSYS Team is convinced that the system can be used effectively within the joint staff arena.

The current unclassified nature of LEXSYS is the primary limiting factor to full utilization of the system in the joint environment. Since a significant amount of joint staff work

requires transmission and discussion of a classified nature, LEXSYS would not meet the requirements for this type of information exchange. Accordingly, future technological developments should allow for exchange of information via teleconferencing systems in a classified manner. In the interim, the Joint Staff could benefit from the resolution of issues and acquisition of "expert" opinions on subjects that are unclassified.

With the emerging emphasis on joint operations by our senior military leaders, the need to communicate among the members of the military services, and Defense Agencies will increase. The requirements to coordinate policy, programs and procedures among the services will, therefore, increase and provide fertile opportunity for the use of LEXSYS. Further, significant service budget reductions and constraints will demand the expanded use of ingenious and cost saving systems such as asynchronous teleconferencing as a decision support mechanism.

LEXSYS should first be expanded Army-wide and operated on a routine basis for at least a year before venturing into the joint staff arena. By that time, the technology should be available to provide a secure communications capability for LEXSYS. Senior military leaders, regardless of service affiliation or staff assignment, stand to significantly benefit from use of LEXSYS. This system will provide for an immediate expansion of their staff, providing a capability unprecedented in the history of the military service.

I. **Confer II Software Proposals.** Confer II is a computer teleconferencing system that provides LEXSYS participants with the capability to communicate with each other. Essentially, Confer II is an effective software package that meets the basic requirements of LEXSYS. However, new users have difficulty mastering the system and enhancements to the software should increase participation levels accordingly.

Based on our experience with LEXSYS, most prospective participants require the coach and pupil method of training to comprehend the system. Practice and documentation are then required to acquire mastery of the system and to enhance participation. Improvements for Confer II will enhance its user friendliness, especially among less experienced computer teleconferencing users. These recommendations for improvement of the Confer II system are based on the experiences of LEXSYS team members as well as other participants on Army Forum Net familiar with Confer II software.

One of the most frequent complaints about Confer II concerns participant use of the Editor function. Many LEXSYS users, both experienced and novice, express frustration over using this function when composing "on-line" text. Using the Beginner's Guide to Confer II, participants can edit their text, but with some difficulty. However, the Beginner's Guide to Confer II can be confusing. For example, the command "alter

/f'bob'Bob'@a", illustrated in this guide, means "alter all occurrences of bob in the file to be Bob." Several other examples contained in the guide are just as confusing.

To improve the Editor function of Confer II, the following recommendations should be implemented:

a. Provide a more extensive and user friendly manual.

b. Incorporate extensive "on-line" help files with samples and demonstrations.

c. Add "on-screen" menus.

Additionally, Confer II should support the wrap-around function while entering text. Word processors use automatic wrap-around functions and require carriage returns only at the end of a paragraph, similar to a typewriter. However, Confer II requires the user to press the <return> key as the text reaches the right end of the screen, continuing the text entry on the following line. Incorporating the wrap-around function in Confer II software would enable participants to type faster and to communicate responses with less errors. Finally, the function would eliminate unwanted characters and symbols when participants download their teleconferencing file to printed text.

Another deficiency identified with the use of Confer II is the capability of only one level of expertise for all users' needs regardless of level of proficiency. A beginner, intermediate, and expert levels of operation within Confer II would enhance use by all levels of participants. In conjunction with these levels, the users should be able to

navigate the system using simple commands, either by typing on the keyboard or using "on-screen" menus. These recommendations would assist the beginner, while still offering the intermediate or expert the full potential of Confer II during teleconferencing.

Confer II should also give the user the capability of reading previous text with a discussion item. For example, if the participant is reading response number 80, and desires to review the original intent of the item, or refer to a previous response, the user should be able to "toggle" backwards by pressing a single key or by using menus to return to the item or a previous response. Incorporation of this initiative will allow the participant to keep the discussions more germane and in context.

Confer II does not currently support an accurate cost analysis of subnet operation and should be modified accordingly. The system should provide for each net to be appropriately charged for each participant who joins or contributes responses to a net. A more elaborate discussion of this problem exists at Part II, Section F, and Appendix B, this Volume.

Finally, Confer II should be protected from computer viruses to ensure that it remains a viable decision support mechanism for senior military leaders. A virus is an attack on software that infects computer systems much the same way as a biological virus infects humans. A computer virus is a small program that searches the computer for a program that is

uninfected. When the virus finds an uninfected program, it produces a copy of itself and inserts the "germ" in the beginning of a healthy program. This insertion can take place in a fraction of a second and the infected program will subsequently execute the virus code before beginning its normal processing, thereby destroying the software.

Multiple user systems such as Confer II are especially virus prone. Computer virus infections can be transmitted between computers over telephone lines and travel unnoticed through the electronic networks that link machines. The computer virus is a serious concern in the computer world that could have an adverse affect on LEXSYS. Software companies in the computer industry are now developing software programs which are designed to kill a computer virus and Confer II should be considered a candidate for such software.

A prime example of the potential adverse impact that a computer virus can cause occurred in November 1988 at Cornell University. A student entered a virus into the DOD Advance Research Project Agency's interconnected computer network known as ARPANET. Within hours, the virus generated unwanted electronic files, clogged storage systems and slowed operations. A more malicious version of the computer virus could insert data to contaminate files or actually destroy files.

The aforementioned proposed changes to Confer II should enhance the use of LEXSYS for new participants and experienced teleconferencing personnel alike. It is our judgment and

experience that technical difficulties, no matter how insignificant, are inhibitors to effective and sustained use of LEXSYS.

PART III.
PROTOTYPE

THE LIVING EXPERT SYSTEM

PART III

PROTOTYPE OPERATIONS ANALYSIS

A. Prototype Overview. Continued evaluation of LEXSYS was accomplished by conducting a prototype operations analysis (PROTOLEX) for each subnet and then analyzing the results. Accordingly, the primary objective of the prototype models was to evaluate the practicality and manageability of this system and to demonstrate its use to senior level military leaders. The Army-wide implementation of LEXSYS will require senior leadership acceptance of the use of teleconferencing as an effective decision support system and the results of these analyses demonstrate support for that acceptance.

Selection of issues for prototype testing was accomplished by reviewing CINC nominations for Military Studies Program (MSP) projects for AWC '89 resident students. A total of 86 issues were identified as originating from a CINC and available for resolution via the teleconferencing subnet. From this group, seven issues were selected for further study and refinement on LEXSYS since they met the scope and intent of the developing expert data base. Contact was then made with a DA Staff or MACOM point of contact to insure that an Issue Facilitator/Proponent was available and was prepared to contribute to issue resolution.

One additional method was used to select a prototype issue to be resolved on the LEXSYS subnet. The Directorate of Management, Office of the Chief of Staff, Department of the

Army, was contacted to identify an issue of significant interest to the Chief of Staff that could be resolved via a network of experts from throughout the Army. One issue was subsequently identified and prepared for resolution.

Building a data base of experts was accomplished by the registration of students from AWC and NDU classes, participants from MACOMs, current teleconferencing members from Army Forum, and subject matter experts from throughout DOD. A detailed discussion of the initial preparation of this data base is provided in this Volume, Part II, Section B, Expert Data Base; and Volume V, Appendix H, Survey Instruments and Results.

Finally, four issues were selected to test the continued development of LEXSYS and to promote the system. Three issues were divided into a statement of the problem, scope of effort and desired result. These issues were then formatted into a problem statement, background data, support data, courses of action and conclusions as applicable. Each issue was entered on a PROTOLEX, established as a subnet of LEXSYS, and experts were invited to participate. Additionally, one issue was entered on the LEXSYS subnet for dialogue and opinion from all LEXSYS participants. For continuity beyond our study group effort, two additional subnets were activated and are projected to remain operational until September 1989. Figure III-A-1 displays these subnets within the Army teleconferencing environment:

ARMY TELECONFERENCING

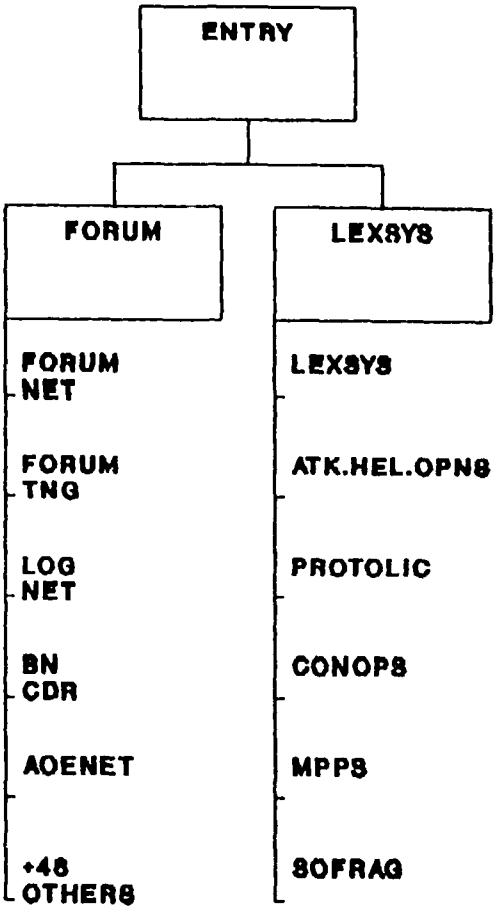
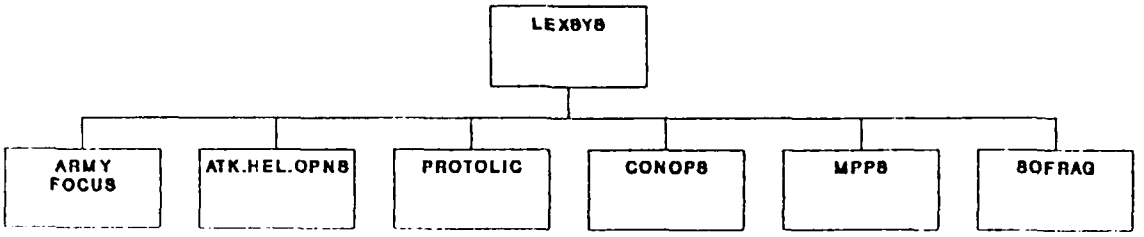


FIGURE III-A-1

Upon completion of each PROTOLEX subnet, a detailed discussion and analysis were conducted to determine the effectiveness of the operation and to document the lessons learned. Analyses of these PROTOLEX subnets is provided at this volume, Appendix C, Prototype Analysis. Figure III-A-2 provides a summary of these PROTOLEX:

LEXSYS NETWORKING



SUMMARY OF PROTOLEX

SUBNET	PARTICIPANTS	OPERATIONAL PERIOD
ARMY FOCUS	35	28 DEC - 28 JAN; 33 DAYS
ATK.HEL.OPNS	22	20 JAN - 31 MAR; 42 DAYS
PROTOLIC	27	24 JAN - ONGOING
CONOPS	10	28 FEB - 21 APR; 53 DAYS
MPPS	26	3 APR - ONGOING
SOFRAG	35	3 APR - ONGOING

FIGURE III-A-2

B. Subnet Identification. The first issue was resolved on the LEXSYS subnet, rather than activating a separate PROTOLEX subnet, based on the nature of the issue and the desire to capture opinion rather than expert consultation. The objective was to review the November 1988 issue of "Army Focus", Item # 30, LEXSYS subnet and 8 individuals participated in the dialogue. Additionally, 27 students from AWC '89 provided comments to the LEXSYS Team Issue Manager, LTC Bill Mathews, for entry as Response #12, to the Item. MAJ Randy Bookout, Congressional Activities Team, Executive Actions Division, Directorate of Management, Office of the Chief of Staff, Department of the Army, served as the Issue

Facilitator/Proponent. The results of this effort were summarized as Item #31 and MAJ Bookout advised that use of LEXSYS for analysis of the publication was extremely valuable and provided the Congressional Activities Team with timely, creditable and essential feedback on the "Army Focus." The text and the analysis of this issue may be found in Volume VII, LEXSYS Subnet Discussion.

The second subnet was established to resolve how best to determine the correct mix of aircraft to conduct a Deep Attack or Cross FLOT operation. The subnet was titled AH-64 Deep Attack Operations (ATK.HEL.OPNS) and a total of 24 subject matter experts participated in resolution of the issue. The objective was to produce a doctrine that specified the optimum use of aircraft in the aforementioned operations and to provide information necessary to publish current Army aviation "how to" manuals. The LEXSYS Team Issue Manager was LTC Bob Bailey and the Issue Facilitator/Proponent was COL Marvin Handy, Director of Combined Arms Tactics (DCAT), Fort Rucker, Alabama.

The third subnet was established to determine what OSD, OJCS and the CINC's should consider as they develop national or regional strategies for low-intensity conflict. The subnet was titled Low-Intensity Conflict, (PROTOLIC), and 27 experts participated in the issue resolution. The objective was to develop a list, with justification, of appropriate considerations to be used in the development of LIC strategies in the Draft FM 100-20 categories of insurgency and counterinsurgency, combating terrorism, peacekeeping operations

and peacetime contingency operations. The LEXSYS Team Issue Manager was COL Jack Maher and the Issue Facilitator/Proponent was LTC Fred Bobbitt, U.S. Special Operations Command, Tampa Bay, Florida.

The next subnet assisted fellow AWC '89 students with their Military Studies Program (MSP) project. The subnet was titled Continuous Operations 2004 (CONOPS) and 10 experts participated in resolution of the issue. The objective of the study was to determine how to achieve a continuous operations capability in the mid-to-high intensity conventional battlefield for the total Army. The LEXSYS Team Issue Managers were LTCs Rich Cruz and Mike Graves and the Issue Facilitator/Proponent was LTC Dave Mallory, an AWC '89 student and member of that MSP effort.

Two additional subnets were established 3 April 1989 based upon interest generated from field commands. Military Police Physical Security (MPPS) and Special Operation Forces Readiness Action Group (SOFRAG) LEXSYS subnets were activated for issue resolution and continuity of effort as the LEXSYS team concludes its study of teleconferencing.

The complete text for these issues is documented in Volume VII of this study.

PART IV.
PROMOTING LEXSYS

THE LIVING EXPERT SYSTEM

PART IV

PROMOTION

The world, as measured by technology, is getting smaller and smaller and the transformation of American businesses by computers has already begun. Most of these evolutionary changes will culminate in the late 1990's as computer usage is expanded to all facets of industry.[21] Civilian corporations have determined that for a very small investment in software, training, and with a properly focused project, useful knowledge engineering systems can be developed. Knowledge systems can be defined as "a computer program that uses knowledge and inference procedures to solve difficult problems."[22] When combined with expert systems such as LEXSYS, an enormous potential exists for solving very complex problems. Tasks that were once thought to be impossible to computerize, have or will become amenable to computer solutions. Industry has already found that expert systems can capture knowledge and put that knowledge to use. When linked with emerging digital telecommunications technologies, promising alternatives lie just ahead.

Technological breakthroughs in micro-chip engineering commonly referred to as Very Large Scale Integration (VSLI), have produced extremely dense and powerful electronic circuits with enormous capabilities. These same chips are fitting previously large computers into very small containers.[23] This

technology when coupled with bubble chip memory, superconductive material, and other innovations that will be maturing in the next four to five years, will evolve into another generation of computers. Sometimes referred to as the "fifth-generation computers," they will possess extraordinary capabilities to handle several different programs simultaneously.[24] These super computers will be small, light weight, inexpensive and will possess massive increments of computational power not currently available with computers today.

Along with these advances, amazing revolutionary changes are also taking place in the telecommunications arena. Already, the nation is being blanketed by digital telecommunication networks that are connecting many homes, offices, and businesses with fiber optic links of enormous capacity.[25] As we enter into the 21st Century, and because these changes are affordable, the whole complexion of how Americans conduct business is changing.

Industry, unlike the Army, has taken the lead in developing the potential for these emerging technologies. Initial steps have already been taken to allow for the coordinated and interactive response of various professional workstations. These workstations consist of a personal computer linked to several expert systems using a variety of hardware (telecommunications) and software programs. By

blending the power of emerging technologies into existing systems, senior executives and department managers will be able to control their operations more efficiently.

Simple knowledge systems are often designed to solve small, difficult problems rather that large complex issues.[26] A prime example is the system that doctors and hospital administrators use to transmit medical information. Often this information is so vital that a life hangs in the balance and the timeliness and accuracy of the data transmission is critical. Another example can be found on Wall Street where stock brokers take advantage of information provided by knowledge systems to make crucial decisions concerning the stock market. In the near future, when "knowledge & expert systems" are linked using "fifth-generation computers," an enormous potential will exist for resolving difficult issues and making tough decisions for complex problems.[27]

The 1980's have set the stage for the technological revolution that is reshaping how individuals are entertained and informed, how organizations are structured and managed, and much, much more. Work stations tied to telecommunications devices (modems) are already providing significant cost savings by frequently eliminating the need for face-to-face conferences. Certainly, as we enter the era of reduced federal spending and cost over-runs, the prospects for expanding use of teleconferencing are exciting and stimulating. Not only will expert systems using teleconferencing techniques reduce travel

expenses, but they will also increase the quantity & quality of subject matter experts available to participate in the resolution of a problem.

LEXSYS has successfully demonstrated that by integrating existing (standard) communications hardware to computer systems throughout the world, senior leaders can effectively use this new and instantaneous (asynchronous) decision support mechanism. This capability is not limited to the Army since it has significant potential application throughout the Department of Defense (DOD).

The evolution of automation and communications began to take shape in the Army some 15 years ago.[28] DOD procurement programs like "Desktop III" which provided approximately 250,000 state-of-the-art minicomputers DOD wide, have complimented the Zenith laptops (Z-184) already in the field.[29] Even though the Army has acquired limited numbers of computers, unlike industry, it lacks a well defined and coherent modernization plan that takes full advantage of emerging technologies.

Information provided at the February 1989 Pre-Command Course (PCC) at Fort Leavenworth, Kansas confirms senior leaders' concerns about Army automation. This data included all Senior Service College graduates from 1983 to 1987. Participants were asked, "what do you think about the current state of automation management in the Army." The following is a culmination of four years of comments:

> "Automation Management! The subject was not covered in any detail in the seminar rooms. We, the Army, are in the dark ages in this area; maybe not at the DOD/DA level, but in the field, at the schools, at the installation, in the tactical units, this is a reality. Decreasing personnel strength and a constrained budget dictate that we do things smarter, quicker and manage better. Automation will enable us to do this. Regrettably, few of us know what we need to assess needs, direct/manage development of automation systems, networks or architectures. Rather than offering automation as an elective, incorporate it into the core curriculum."[30]

If our Army is to keep pace with the challenges of the future and come out a winner then we must seriously review the computer applications and take advantage of the opportunities made possible by emerging technology.

Two separate and distinct courses of action lay ahead. The first is a near term solution that takes advantage of current expert systems like LEXSYS. The second involves taking advantage of emerging technologies in the next four or five years that will introduce the fifth-generation of computers. The application that will exist with the redesigned expert systems can be used to harness decision making techniques in a fashion that is user friendly as well as powerful. This new system will reveal the limitation of its knowledge and estimate the uncertainty of its conclusions; it will process and distill the experience of many experts and apply it to a problem without bias; then it will tell us upon demand what assumptions

it made and what line of reasoning it used. In short, this system, and many more just like it, will add a breadth and depth to our reasoning and decision making not seen before.[31]

As the Army prepares to transition into the 21st Century, now is the time to seize the initiative and capitalize on this emerging technology. Army teleconferencing is not an idea before its time but an investment in the future.

PART V.
GLOSSARY

THE LIVING EXPERT SYSTEM

PART V

GLOSSARY OF TERMS

ASYNCHRONOUS TELECONFERENCING: Communicating with individuals using a computer and a telephone linkage (modem) network by conferencing in a non-simultaneous or non-concurrent manner.

BASELINE ASSESSMENT SURVEY (BAS): A questionnaire and data collection form designed to capture expertise of potential teleconferencing participants. The BAS addresses 124 various subject areas within 16 broad subject areas.

COMPUTER LITERATE: Individual who possesses the ability to operate a personal computer and requires minimal training for word processing and teleconferencing system applications.

DISK-BASED TUTORIALS: An "on-line" system designed to instruct participants on teleconferencing procedures and techniques.

EXPERT DATA BASE: A registry of individuals judged to be subject matter experts in one or more areas of military significance. Data base management allows for retrieval of individuals by name or by subject matter. Individuals have volunteered to contribute to issue resolution on a LEXSYS subnet. Also referred to as a talent data bank.

FIFTH-GENERATION COMPUTERS: Developmental computers that will incorporate fundamentally new designs for increased speed and power for calculating and manipulating data. Expert systems will reach maturity when these computers are available to provide for massive increases in power and processing capability.

ISSUE FACILITATOR: Individual designated to manage the issue placed on a LEXSYS subnet for resolution. The member of a MACOM or Department of the Army staff with primary interest in the issue being resolved. Individual interfaces with the senior leader (proponent) requesting issue resolution and the LEXSYS subnet participants.

ISSUE MANAGER: Member of the LEXSYS Military Studies Program project who served as the team coordinator for the establishment and operation of a PROTOLEX for resolution of a specific issue.

LIVING EXPERT SYSTEM (LEXSYS): An asynchronous teleconferencing system using a computer and modem to network with participants. This network provides senior leadership with a group of experts to resolve issues via this cost effective decision support mechanism.

NETWORKING: Establishing external communication links between computers to allow for sharing of data bases and information.

PROTOLEX: A LEXSYS subnet established for the purpose of providing a decision support mechanism for senior leadership to resolve an issue via teleconferencing. Subnet also allows for the evaluation, analysis and refinement of the LEXSYS system.

SUBJECT MATTER EXPERT: Individual who participated in the Baseline Assessment Survey (BAS) and was judged an "expert" in one or more subject areas of military significance. A numerical rating of 4-5 on the BAS qualifies an individual as an "expert". Individual possesses extensive education and/or current experience in a subject area and is able to conduct a critical analysis or defend his position at the general officer level.

SUBJECT MATTER KNOWLEDGE: COMPILED KNOWLEDGE: Information that an individual gathers, organizes and stores. SUBJECT MATTER EXPERT: Knowledge possesses by an individual that is far above the norm. Expertise often consists of massive amounts of information, facts, and wise procedures allowing for in-depth analysis of problems. WORKING KNOWLEDGE: Integrated collection of facts that an individual uses to produce competent performance. NOVICE KNOWLEDGE: Information compiled as a result of practical experience without depth.

VERY LARGE SCALE INTEGRATION (VLSI): Layout and construction of extremely dense and powerful electronic circuits that can be placed on small computer chips. VLSI technologies are the essence for designing enormously powerful computers to fit into small containers.

ENDNOTES

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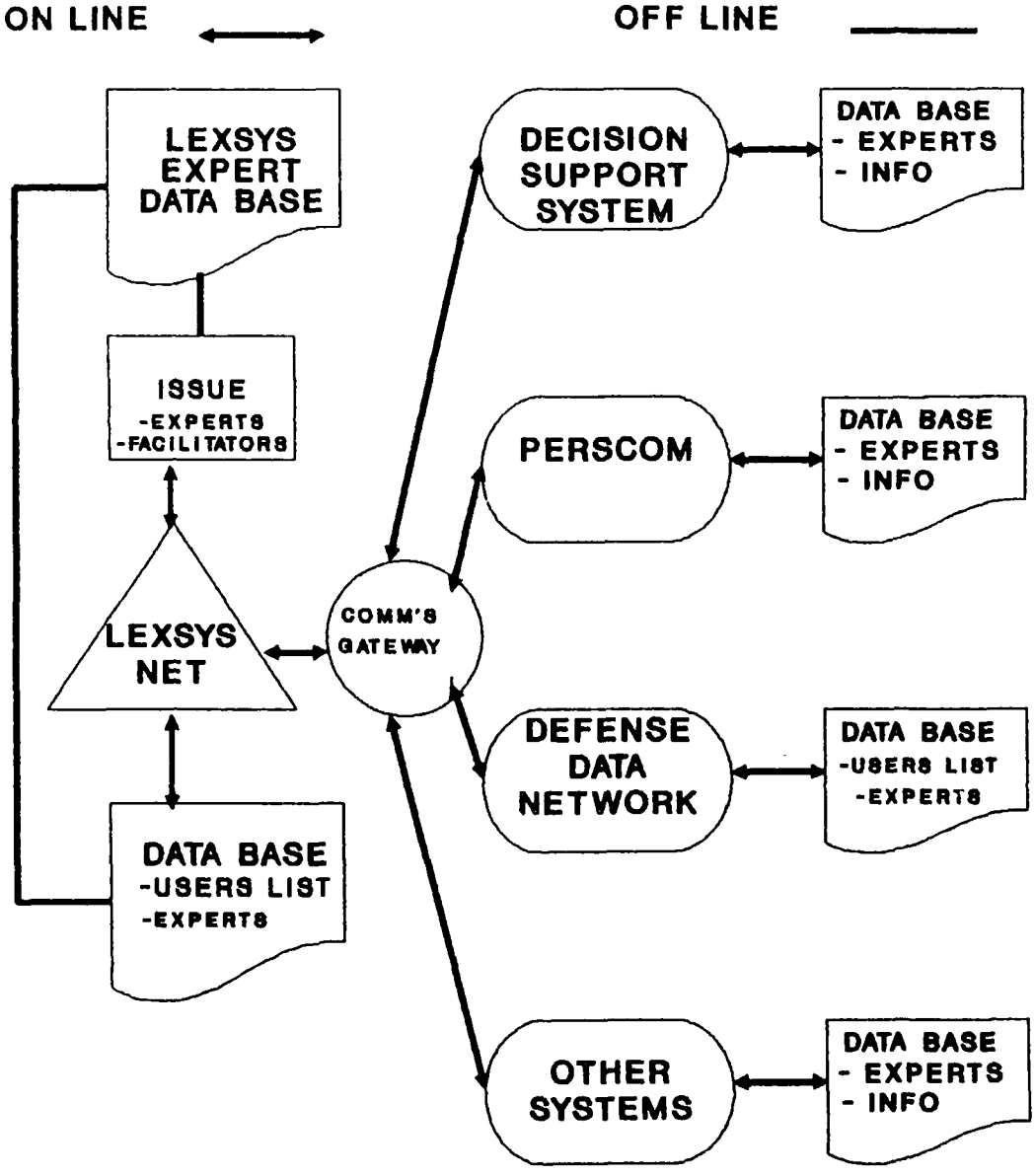
APPENDICES

LIVING EXPERT SYSTEM

APPENDIX A

DATA BASE CONNECTIVITY



LIVING EXPERT SYSTEM

APPENDIX B

COST ANALYSIS

This cost analysis is provided vice a cost-benefit analysis since Volume I provides detailed discussions on establishing LEXSYS and the benefits derived from its use. This analysis was conducted to determine the cost differential between computer teleconferencing and meetings or conferences requiring the expenditure of TDY funds.

The PROTOLIC subnet was selected for analysis because of the availability of cost data since subnet activation on 24 January 1989. An analysis of the PROTOLIC subnet revealed that:

-27 participants were registered on the net

-of these 27 participants, an average of seven entered the net daily

--of the seven, 2/3 or 4.7 participants entered the subnet during prime time (07:00-18:00)

--the average cost of prime time use was $.72 per minute

--of the seven, 1/3 or 2.3 participants entered during non-prime time (18:00-07:00)

--the average cost of non-prime time use was $.185 per minute

-a total of 2822 minutes were spent on the net by the participants during the period 24 January - 14 March 1989

-the cost for prime and non-prime use is as follows:

--2/3 x 2822 minutes = 1891 minutes for a prime time cost of 1891 x $.72 - $1361.52

--1/3 x 2822 minutes = 931 minutes for a non-prime time cost of 931 x $.185 = $172.24

-the total cost of PROTOLIC subnet operations from 24 January - 14 March 1989 was $1361.52 + $172.24 = $1533.76.

The actual amount of time required to resolve the PROTOLIC net issue can not be determined since discussions on the subnet continues. However, if the issue required twice the time already expended, the total teleconferencing cost for resolving the PROTOLIC issues would approximate:

$1533.76 x 2 = **$3067.52.**

To approximate the cost of a traditional conference or meeting to resolve the PROTOLIC subnet issues, the following assumptions apply:

-eight hours of conference time is required

-Tampa, Florida would be the conference site based on proximity to the sponsoring MACOM

-only 21 of the 27 participants on PROTOLIC are available to attend

-the conference would begin at 13:00 on day 1 and end at 12:00 on day 2

Tab A contains a breakout of the TDY conference costs. Using DA travel and transportation rates, the approximate cost of a TDY Conference is **$9836.50.** Therefore, the delta between a computer teleconference and a traditional conference is:

$9836.50 - $3067.52 = $6768.98

Conclusively, computer teleconferencing is a cost effective means of issue resolution.

TDY CONFERENCE -- TAMPA, FL

CONFERENCE START: DAY 1: 1300 HRS
CONFERENCE END: DAY 2: 1200 HRS

SVC MBR	DUTY STA	MODE OF TRAVEL	RENTAL CAR	#OF DAYS	TRANS COSTS	PER DIEM	RENTAL CAR COSTS	LODGING COSTS
A	Ft Leavenworth, KS	fly	yes	3	$280	$71.50	$90	$104
B	Tampa, FL	no TDY costs involved						
C	Tallahassee, FL	fly	yes	2	$166	$39	$60	$ 52
D	Ft Knox, KY	fly	yes	2	$328	$45.50	$60	$ 52
E	Ft Bragg, NC	fly	yes	2	$374	$39	$60	$ 52
F	"	"	"	"	$374	$39	$60	$ 52
G	"	"	"	"	$374	$39	$60	$ 52
H	Carlisle Brks, PA	fly	yes	3	$326	$65	$90	$104
I	"	"	"	"	$326	$65	$90	$104
J	"	"	"	"	$326	$65	NO	$104
K	"	"	"	"	$326	$65	NO	$104
L	"	"	"	"	$326	$65	NO	$104
M	Atlanta, GA	fly	yes	2	$178	$45.50	$60	$ 52
N	Hampton, VA	fly	yes	2	$222	$45.50	$60	$ 52
O	Honolulu, HI	fly	yes	4	$544	$91	$90	$156
P	"	"	"	"	$544	$91	$90	$156
Q	Lake Placid, FL	POV	yes	2	$49.50	$39		$ 52
R	Ft Gordon, GA	fly	yes	2	$310	$45.50	$60	$ 52
S	Miami, FL	fly	yes	2	$ 80	$39	$60	$ 52
T	Ft Benning, GA	fly	yes	2	$228	$45.50	$60	$ 52
U	Boulder, CO	fly	yes	3	$298	$65	$90	$104
					$5979.50	$1105	$1140	$1612

TOTAL = **$9836.50**

NOTE: Duty Station reflects actual data on the PROTOLIC net participants. All costs computed by Travel and Transportation Branches at Carlisle Barracks, PA.

LIVING EXPERT SYSTEM

APPENDIX C

PROTOTYPE OPERATIONS ANALYSIS (PROTOLEX)

A. AH-64 Deep Attack Operations PROTOLEX Subnet (ATK.HEL.OPNS):

1. PROTOLEX Overview. This topic was initially submitted to the U.S. Army War College for study by CINCUSAREUR. Later, the topic was identified as one of the top issues during Fort Rucker's annual Brigade Commanders' Conference held in December 1988. Because of LEXSYS OCONUS connectivity limitations with USAREUR, the Directorate of Combined Armed Tactics (DCAT), Fort Rucker, became the Issue Facilitator/Proponent for the Deep Attack issue. The following outline was established based on input from USAREUR and DCAT:

PROBLEM STATEMENT:

How best to determine the proper/correct aircraft type/mix of AH-64, OH-58C or AH-58D (Attack-Scout mix) to conduct a Deep Attack or cross FLOT operation.

SCOPE & DEPTH:

Using the current technological advantages and maneuverability of today's weapon systems, explore and determine correct tactics, techniques and procedures needed to fight and win in a European environment.

DESIRED RESULTS:

Produce doctrine that will take advantage of emerging systems and provide information necessary to publish current and future Army Aviation "How To" manuals.

2. **PROTOLEX Discussion.** The AH-64 Deep Attack operations milestones extended over a three month period and included the following initial discussion items:

ITEM	TOPIC
3	**Administrative Information**
4	**Background Information**
5	**Assumptions**
6	**Task Organization & Scout-Attack Roles**
7	**Command, Control, Communications, & Intel (C31)**
8	**Cross FLOT**
9	**Routes & Movement**
10	**Battle Positions**
11	**Target Engagement**
12	**Other Considerations**

Resolution of this issue was not a Field Manual exercise that simply encouraged participants to recite chapter and verse from existing doctrine. However, it was designed to facilitate innovative thought and ideas while exploring the endless realm of possibilities inherent in the new technology aircraft. The focus of this issue was to determine the proper/correct aircraft type/mix of AH-64, OH-58C, or AH-58D (attack-Scout mix) to conduct a deep attack operation. Current Army doctrine was used to help guide the effort but not to impede the thought process.

Participants, as subject matter experts, were requested to make comments on the various items listed on the preceding page similar to a face-to-face meeting. Participants had the right to challenge the author if they did not agree or understand a comment. The better the participant understood the comment, the better the corporate response.

Initially, students from AWC '89 and the faculty were administered the LEXSYS Baseline Assessment Survey (BAS) to identify subject matter experts. Ten of the 18 Army aviators in AWC '89 were asked to join the AH-64 Deep Attack subnet. Participants located at TRADOC, FORSCOM, and CAC also contributed to the resolution of the issue.

After all participants entered the net they were encouraged to comment on items 2 through 10 and asked to consider adding additional items.

The following agenda was used throughout the conduct of this issue:

DATE/SUSPENSE	ACTION	RESPONSIBILITY
20 JAN 89	Study group begins formulation of issue	PROPONENT
28 FEB 89	1st Draft Due... Completes analysis, comparison, testing possible alternatives solutions, recommendations	PROPONENT
15 MAR 89	2nd Draft Due... Proponent accepts results or gives additional guidance	PROPONENT
31 MAR 89	Final Draft	PROPONENT
31 MAR 89	Issue subnet terminated	LEXSYS MANAGER

3. PROTOLEX CONCLUSIONS.

A. The bulk of discussion on the subnet was conducted by 6 of the 21 participants.

B. Some individuals invited to join the subnet and participate did not offer any comments to the discussion.

C. The Issue Facilitator/Proponent had connectivity problems that persisted throughout the duration of the subnet.

D. Dialogue on the subnet was multidisciplinary and multiservice. Army aviators, safety officers, tankers, signal officers & military intelligence officers were active participants. Further, a mix of Army, Air Force and civilian personnel within DOD participated.

E. Participation on the subnet during the last two weeks in March was restricted because of organizational and operational distractors (field problems, TDY trips and other priorities).

B. Low-Intensity Conflict PROTOLEX subnet (PROTOLIC):

1. Prototype Overview: The low-intensity conflict (LIC) topic was submitted to the U.S. Army War College for student research and study by SOUTHCOM and WESTCOM. However, since neither command could support the study, the LEXSYS team acquired proponency from USSOCOM. The topic was selected as a PROTOLEX for its joint interest applicability and its relevancy as a current military issue. The following outline was jointly developed by the LEXSYS Team Issue Manager and the SOCOM Issue Facilitator/Proponent:

PROBLEM STATEMENT:

What should DOD, JCS and the CINCs consider as they develop national/regional strategies for LIC in the area of insurgency/counter-insurgency, combating terrorism, peacekeeping operations, and peacetime contingencies.

SCOPE AND DEPTH:

Using doctrine contained in Draft FM 100-20, Military Operations In Low-Intensity Conflict, as a point of departure, explore and determine considerations to be used in strategy formulation in the four categories of low-intensity conflict.

DESIRED RESULTS:

Develop appropriate considerations to be used by OSD, OJCS, and the CINCs in their formulation of LIC strategies in Draft FM 100-20, categories of insurgency/counter-insurgency, combating terrorism, peacekeeping operations and peacetime contingency operations.

2. **PROTOLEX Discussion:** The PROTOLIC subnet was activated on 24 January 1989 and remained operational during the preparation of this report. The first three items were initially entered onto the subnet to provide administrative information, background, and a common base of definitions for participants. The next 10 substantive items of discussion were introduced sequentially as discussion slowed on the current subject area. Thus, introduction of the following items was accomplished in a controlled manner:

ITEM	TOPIC
1	**Administrative information to include problem statement, scope, and desired results.**
2	**Definitions (Draft FM 100-20).**
3	**Background statement.**
4	**Political considerations.**
5	**Economic considerations.**
6	**Social considerations.**
7	**Other participants.**
8	**Enemy force considerations.**
9	**Friendly force considerations.**
10	**Geographical considerations.**
11	**Historical considerations.**
12	**Intelligence considerations.**
13	**Other considerations.**

Items 4-13 were introduced for discussion on the four broad categories of LIC: insurgency/counter-insurgency, combating terrorism, peacekeeping operations, and peacetime contingencies. Resolution of this issue was acquired by participants' contributions to the asynchronous dialog on the four broad

categories of LIC. Although Draft FM 100-20 was accepted as the basis for LIC doctrine, considerations for development of LIC strategy required innovative thought and substantive comment to the PROTOLIC subnet. The focus throughout operation of the subnet was considerations for strategy development rather than development of a LIC strategy.

Prospective participants were initially identified from AWC '89 using the Baseline Assessment Survey to identify subject matter experts. Additional participants were identified by the LEXSYS Team Issue Manager from the talent data bank of current teleconfencing participants and from acquaintances who had LIC expertise. Resultantly, 27 individuals were permitted access. The subnet was in operation at a time when other AWC '89 students were concentrating on their own Military Studies Program research effort, reducing their participation with LEXSYS.

3. PROTOLEX CONCLUSIONS.

A. The majority of the subnet discussion was accomplished by 7 of the 27 participants.

B. Many of the individuals invited to join and participate did not offer comments to the discussion.

C. The Issue Facilitator/Proponent was not actively involved in the discussion. As a result:

1. The information provided in discussion was not processed by Issue Facilitator/Proponent.

2. Individuals may not have been motivated to participate on the subnet.

D. An Issue Facilitator should anticipate the requirement to personally invest at least 20 hours to shape the issues, identify and train subject matter experts, and to activate the subnet. Further, he must devote at least one hour per day to subnet operations while actively working with an issue for resolution.

C. Continuous Operations 2004 PROTOLEX subnet (CONOPS):

1. PROTOLEX Overview. This study topic was submitted to the U.S. Army War College by HQDA, DCSOPS-FD and a group of AWC '89 students chose this topic as their Military Studies Program (MSP) project. Subsequently, the LEXSYS team provided the CONOPS team the opportunity to resolve a portion of their issue on a LEXSYS subnet. The following outline was developed by a member of the CONOPS MSP team and provided to activate a LEXSYS subnet:

PROBLEM STATEMENT:

How to achieve continuous operations capability on the mid-to-high intensity conventional battlefield with the total (RC and AC) Army. Identify the impacts on doctrine, organization, equipping, training and leader development.

SCOPE & DEPTH:

The CONOPS 2004 study is focused at Corps and below, and addresses battlefield operating systems that include command and control, maneuver, mobility and survivability, intelligence, air defense artillery, combat service support and fires. Continuous operations differ from sustained operations in that CONOPS involves cyclical or varying levels in the intensity of a particular activity or activities (not 0 state) during combat operations that are normally sustained over a period of days. Sustained operations on the other hand involves a constant or near constant level of activity over a period of hours. The mission of the CONOPS team is to identify ways and means to

maintain the efficiency and reliability of soldiers, systems and equipment during continuous operations. Additionally, the team is to identify the impact on doctrine, organization, equipping, training, and leader development.

DESIRED RESULTS:

Develop innovative methods and procedures that improve the effectiveness of soldiers, battlefield operating systems and units during continuous operations. Additionally, identify the resultant impact on doctrine, organization, equipping, training, and leadership.

2. PROTOLEX Discussion. The CONOPS subnet operated for six weeks and included the following discussion issues:

ITEM	TOPIC
1	**Background**
2	**Scope & Definition**
3	**Methodology**
4	**Organization by Combined Arms Team**
5	**Multiple Crews and Second in Command**
6	**Protecting Lines of Communications**
7	**Refinement of CONOPS Study Objectives**

Coordination between LEXSYS and CONOPS team members resulted in a plan to develop, post, and discuss issues. The LEXSYS Team Issue Manager entered an issue on both the Forum and LEXSYS nets seeking participation by subject matter experts. Resultantly, five participants were acquired from the Forum Net. Three CONOPS MSP team members, three LEXSYS team members, and two Army War College faculty instructors participated on the subnet.

Four pertinent issues (4 through 7) were actually posted on the subnet and were primarily oriented towards the combat service support environment.

3. PROTOLEX CONCLUSIONS:

A. The majority of subnet discussion was accomplished by 4 of the 10 participants.

B. The CONOPS team members lack of familiarity with computers and teleconferencing inhibited participation throughout operation of the subnet.

C. The Issue Facilitator infrequently participated in the subnet discussion.

D. The LEXSYS subnet capability was not addressed initially when the CONOPS team developed their issue, research methodology, and scope of effort. Resultantly, the subnet was placed in operation towards the end of the team MSP effort.

LIVING EXPERT SYSTEM

APPENDIX D

LEXSYS SUBNET PARTICIPANTS

BOB BAILEY, Lieutenant Colonel, Aviation Branch, U.S. Army. Currently a student at the U.S. Army War College and a member of the LEXSYS Military Studies Program project. LEXSYS Team Issue Manager for AH-64 Deep Attack Operations (ATK.HEK.OPNS) subnet. Extensive rotary wing operational experience and concepts and doctrine development for attack helicopter operations.

MICHAEL BLEDSOE, Department of the Army Civilian (GM-15). Deputy Director, Safety Office, HQ, U.S. Forces Command, Atlanta, Georgia. Emphasis on safety in tactical operations. Army aviator and a master parachutist.

FRED BOBBIT, Lieutenant Colonel, Infantry, U.S. Marine Corps. Assigned to Studies and Analysis Directorate, HQ, U.S. Special Operations Command, Tampa Bay, Florida. Issue Facilitator/ Proponent for the Low Intensity Conflict (PROTOLIC) LEXSYS subnet.

RANDALL BOOKOUT, Major, Infantry, U.S. Army. Member of the Congressional Activities Team, Executive Actions Division, Directorate of Management, Office of the Chief of Staff, Department of the Army. Issue Facilitator for Item #30 & #39 on the LEXSYS subnet concerning the November 1988 issue of "Army Focus".

GREG BOYER, Lieutenant Colonel, Signal Corps, U.S. Army. Member of the Student Administration Office, U.S. Army War College. Assisted the LEXSYS team with numerous projects and provided invaluable network guidance throughout the Military Studies Program project. Communications systems testing and signal unit fixed station operational experience.

DICK BRAUER, Colonel, U.S. Air Force. Commandant, USAF Special Operations School, Hurlburt Field, Florida. Twelve years joint special operations experience. Interests in joint tactics, hostage rescue planning and joint air operations.

JOHN BUCKLEY, Department of the Army Civilian (GS-13). Futures Training Analysist, Futures Training Division, Training Development and Analysis Directorate, HQ, U.S. Army Training and Doctrine Command, Fort Monroe, Virginia. Previous experience as Chief, Instructor Technology Division, Army Air Defense School, Fort Bliss, Texas.

JERRY CARPENTER, Lieutenant Colonel, U.S. Air Force. Chief of Safety, 4450th Tactical Group/USAF Tactical Air Command. Significant experience in tactical reconnaissance, fighter and air-to-air combat training. Air War College graduate.

TOM CARTER, Chaplain (Colonel), Chaplain's Corps, U.S. Army. Chief, Operations and Support, Chaplains' Office, HQ, U.S. Army Training and Doctrine Command, Fort Monroe, Virginia. LEXSYS participant during 1988. Specific interests in leadership, battle fatigue/stress management and personnel management.

JIM CARY, Lieutenant Colonel, Aviation Branch, U.S. Army. Member of the U.S. Army Forum Office, Directorate of Management, Office of the Chief of Staff, Department of the Army. Project officer for the Reserve Component Instructional Information Management System consisting of a video training system for the Reserve Components.

JACK CLARK, Lieutenant Colonel, U.S. Air Force. Currently a student at the U.S. Army War College and conducting research on the identification of capabilities for air support of clandestine operations. Author of Fighter Weapons School instructional texts on tactics and techniques. Also authored Multi-Command Manual 3-1, Tactical Doctrine for the F-4 and F-16 fighter aircraft.

RICHARD CROSSLAND, Colonel, Field Artillery, U.S. Army Reserve. Senior Army Reserve Advisor to the U.S. Army Soldier Support Center, Fort Benjamin Harrison, Indiana. Combat experience as intelligence advisor. Background in writing training development portion of integrated exercise support materials.

DENNIS CRUMLEY, Brigadier General, U.S. Army. Assistant Commandant, U.S. Army Armor School, Fort Knox, Kentucky. Extensive tanker and training experience. Commanded from Platoon to Brigade level in the 3D Armored Division, Germany.

RICH CRUZ, Lieutenant Colonel, Signal Corps, U.S. Army. Currently a student at the U.S. Army War College, Carlisle, Pennsylvania and a member of the LEXSYS Military Studies Program project. LEXSYS Team Issue Co-Manager for the Continuity of Operations 2004 (CONOPS) subnet. Communications-Electronics and signal intelligence/electronic warfare experience.

MARK CURRAN, Lieutenant Colonel, Aviation Branch, U.S. Army. S-3, 101st Aviation Brigade, 101st Air Assault Division, Fort Campbell, Kentucky. Experience in attack helicopter operations and interested in evolving doctrine for aviation assets.

TERRY DOHERTY, Social Scientist, Internal Defense and Development, U.S. Army Special Warfare Center, Fort Bragg, North Carolina. Primary background and experience in Low Intensity Conflict development and operations.

BILL DURBIN, Lieutenant Colonel, Aviation Branch, U.S. Army. Commander, 1-123 Attack Helicopter Battalion, 7th Infantry Division, Fort Ord, California. Previous experience with force integration issues and impact of modernization on CINC warfighting capability.

MARK FERRELL, Captain, Aviation Branch, U.S. Army. Currently assigned to III Corps, Fort Hood, Texas. Previous experience as an AH-64 troop commander and Squadron S-3 officer at III Corps.

JIM FLETCHER, Lieutenant Colonel, Special Forces, U.S. Army. Currently a student at the U.S. Army War College, Carlisle, Pennsylvania and conducting research on campaign planning for Low Intensity Conflict. Previous experience with Special Forces operations, contingency planning and forces development.

THOMAS GARRETT, Lieutenant Colonel, Aviation Branch, U.S. Army. Commander, 101st Aviation Battalion (AH-64), 101st Air Assault Division (Air Mobile), Fort Campbell, Kentucky. Previous experience as a helicopter gunship pilot and ranger operations.

CHARLES GIASSON, Lieutenant Colonel, Signal Corps, U.S. Army. Currently a student at the Industrial College of the Armed Forces and serving as student liaison for the LEXSYS project at the U.S. Army War College. Background and experience with signal unit missions and computer operations.

LAWRENCE GILLESPIE, Colonel, Aviation, U.S. Army National Guard. Currently a student at the U.S. Army War College and conducting research on the civil reserve fleet during mobilization. Over 25 years aviation experience including consultant responsibilities to the Governor of Guyana and aviation advisor to the Hughes Aircraft Company.

RICH GOLDSMITH, Colonel, Armor, U. S. Army. Director, Professional Development, Department of Command, Leadership and Management, U.S. Army War College, Carlisle, Pennsylvania. Previous experience as an Armor Brigade Commander and Corps G-3 in the Federal Republic of Germany.

BILL GOODWIN, Major, Aviation Branch, U.S. Army. Currently assigned to the U.S. Army Aviation Safety Center, Fort Rucker, Alabama. Extensive aviation experience including command of a UH-60 troop unit with the 101st Airborne (Air Assault) Division at Fort Campbell, Kentucky.

MIKE GRAVES, Lieutenant Colonel, Signal Corps, U.S. Army. Currently a student at the U.S. Army War College and a member of the LEXSYS Military Studies Program project. Network Organizer for LEXSYS and Team Issue Co-Manager for the Continuity of Operations 2004 (CONOPS) subnet. Aviator, with extensive signal unit and communications combat development experience.

WES GROESBECK, Colonel, Infantry, U.S. Army. Assistant Chief of Staff for Civil Affairs (G-5), Third U.S. Army. Responsible for civil affairs, psychological operations, host nation support and management of linguists. Experience with Low Intensity Conflict operations since 1966.

DAVID HOOPENGARDNER, Lieutenant Colonel, Infantry, U.S. Army. Leadership Staff Officer, Leadership Section, Retention Division, Office of the J1, HQ, U.S. Forces Command, Atlanta, Georgia. Experience and interests in leadership and management, people skills and human behavior.

VERN HUMPHREY, Civilian Program Manager, Collective Training, Allen Corporation. Specializes in Army Collective Training Analysis and Development. Major interest in force synchronization through integrated analysis of mission, doctrine, and training.

HORACE HUNTER, Colonel, Field Artillery, U.S. Army. (Retired), Low Intensity Conflict Coordinator, HQ, Western Command, Schofield Barracks, Hawaii. Manages the LIC professional development program with heavy emphasis on counter-insurgency. Previous military experience in Army Field Artillery and Infantry including four years service in the Republic of South Viet Nam.

BOB JACKSON, Colonel, Infantry, U.S. Army. Commander, 3d Brigade, 25th Infantry Division (Light), Schofield Barracks, Hawaii. Experience with Infantry operations with specific emphasis on combined exercise programs. Frequent contact with allies in the Pacific Basin threatened by Low Intensity Confict.

JOE JENKINSON, Lieutenant Colonel, Aviation Branch, U.S. Army. Currently a student at the U.S. Army War College, Carlisle, Pennsylvania and conducting research on continuous operations in 2004. Experienced in Cross-FLOT operations and attack helicopter operations in Germany, Vietnam and the U.S.

MICHAEL JINDRA, Major, Chemical Corps, U.S. Army. Chief, Command, Control, Communications, and Computers (C4) Branch, U.S. Army Chemical School, Fort McClellan, Alabama. Participant in LEXSYS for the last two years. Interested in artificial intelligence techniques, decision support systems, and battlefield automated systems.

MICHAEL KANNER, Captain, Armor, U.S. Army. Deputy Assistant Chief of Staff, Force Integration Office (G-6), 9th Infantry Division, Fort Lewis, Washington. A participant in teleconferencing since 1986. Previous instructor experience at the U.S. Army Infantry and Armor Schools.

JIM KASPRZAK, Department of the Army Civilian. Deputy Plans and Programs Directorate, Personnel Systems Information Command, Alexandria, Virginia. Serves as the LEXSYS intermediary to the Army Personnel Command (PERSCOM) data base to identify prospective participants for LEXSYS. Served in various positions of responsibility for technology management. U.S. Army Reserve officer in the Adjutant General's Corps.

ROBERT LEONHARD, Captain, Infantry, U.S. Army. Team member, Directorate of Concepts Development, Concepts and Studies Division, U.S. Army Infantry School, Fort Benning Georgia. Previous infantry unit command experience. Current interests in continuous operations and sustainment of the force.

JOHN LESKO, Captain, Armor, U.S. Army. Assigned to the U.S. Army Materials Technology Laboratory, Watertown, Massachusetts. Participating in advanced materials applications for future combat and tactical systems. Previous Armored Cavalry and research and development experience.

RICHARD LUKENS, Department of the Army Civilian (GS-12). Management Analysist, Assistant Chief of Staff, Resources Management, HQ, Eighth U.S. Army, Yongsan, Korea. Background in audit and management analysis. Communicates with LEXSYS via modem access to the Defense Data Network (DDN).

JACK MAHER, Colonel, Aviation Branch, U.S. Army. Currently a student at the U.S. Army War College and a member the the LEXSYS Military Studies Program project. LEXSYS Team Issue Manager for the Low Intensity Conflict (PROTOLIC) subnet. Army Aviator with squadron and troop command experience. Also operation and planning experience at HQDA level.

MIKE MALONE, Colonel, Infantry, U.S. Army. (Retired). Principle proponent of the LEXSYS system as envisioned and articulated in 1971. Instructor of leadership, communications, and management at the U.S. Army War College for 9 years. Soldier who has been an inspiration to countless younger soldiers as a true mentor, coach, and friend. Conference organizer for the teleconferencing net on Army Battalion Command (Army:BnCdr).

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BILL MATHEWS, Lieutenant Colonel, Adjutant General's Corps, U.S. Army. Currently a student at the U.S. Army War College and a member of the LEXSYS Military Studies Program project. LEXSYS Team Issue Manager for "Army Focus" (Item #30 & #39) LEXSYS subnet. Extensive experience in distributing and manning the force with emphasis on theater level replacement operations.

JEFF MAYO, Command Sergeant Major, U.S. Army. Command Sergeant Major, 260th Military Intelligence Battalion, Miami, Florida. Extensive Low Intensity Conflict operational experience on a world wide basis. Interested in all aspects of Low Intensity Conflict.

CLAY MELTON, Lieutenant Colonel, Armor, U.S. Army. Currently a student at the U.S. Army War College and conducting research on command climate and its establishment. Over 5 years experience in the Federal Republic of Germany in Armor command assignments and personnel mananagement staff responsibilities.

GLENDA NOGAMI, Department of the Army Civilian (GS-14). Director, Curriculum Research, Department of Academic Affairs, U.S. Army War College, Carlisle Barracks, Pennsylvania. Interests in decision making, organizational behavior, and research design. Provided invaluable assistance in the design of the Baseline Assesment Survey (BAS II).

TOM NORTON, Chaplain (Colonel), Chaplain's Corps, U.S. Army. Chaplain, I Corps, Fort Lewis, Washington. Participated in LEXSYS Military Studies Project program last year as an Assistant Network Organizer. Interests include homiletics, ethics, leadership, and computer applications.

JOSE OCASIO, Lieutenant Colonel, Adjutant General's Corps, U.S. Army. Currently a student at the U.S. Army War College, Carlisle, Pennsylvania and conducting research on the Latin American reaction to U.S. involvement in their affairs. Previous personnel and administration unit and battalion command. Served in the Executive Office, Office of the Chief of Staff, HQDA.

JACK PLANT, Department of the Army Civilian (GS-13). Assigned to HQ, U.S. Special Operations Command, Tampa Bay, Florida. Currently working on the development of the Studies Information Management System (SIMS). Thirty-three years experience in the Reserve Components, primarily with Special Forces.

RICHARD POMAGER, Colonel, Military Police Corps, U.S. Army. Member of the Staff and Faculty, U.S. Army War College, Carlisle, Pennsylvania and the LEXSYS Military Studies Program project advisor. Provided invaluable assistance and guidance to the LEXSYS team. Extensive background and experience in Military Police operations.

DOUG PRIOR, Major, Infantry, U.S. Army. Chief, Current Training Division, U.S. Army Training Board, HQ, U.S. Training and Doctrine Command, Fort Monroe, Virginia. Previous experience as an S-3 of a Mechanized Infantry Battalion and as a force modernization officer.

MICHAEL RAPP, Lieutenant Colonel, Infantry, U.S. Marine Corps. Marine representative to the John Fitzgerald Kennedy Special Warfare Center and school, New York. Extensive experience in Infantry operations and deployments throughout the world.

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D. D. SMITH, Lieutenant Colonel, Aviation, U.S. Army. Director, Doctrine Division, U.S. Aviation Center, Fort Rucker, Alabama. Extensive experience in concepts and doctrine for employing rotary wing aircraft in combat.

DAVE SMITH, Master Sergeant, U.S. Army (Retired). Provided technical support for LEXSYS for participants in the Fort Leavenworth Kansas and Kansas City area. Major interests in values, leadership and the future.

JIM SMITH, Major, Aviation Corps, U.S. Army. Chief, Information Center, Sixth U.S. Army, Presidio, San Francisco, California. Extensive experience as a rotary wing aviator and combat developments responsibility for aviation assets. Also interested in computers, automation and technical management support.

DAVE SPRACHER, Lieutenant Colonel, U.S. Air Force. Currently student at the U.S. Army War College and studying continuous operations in 2004 with emphasis on personnel sustainment. Major participant on LEXSYS subnet "CONOPS". C-130 pilot with specific interests in airlift and joint operations.

TIM TATUM, Chaplain (Colonel), Chaplain's Corps, U.S. Army. Director of Ethics, Department of Command, Leadership and Management, U.S. Army War College. Also represents the Department in matters dealing with automated instruction, ADP, and software engineering. Faculty Advisor for the LEXSYS project last year.

JERRY THOMPSON, Lieutenant Colonel, Infantry, U.S. Army. Chief, Low Intensity Conflict Proponency, U.S. Army Command and General Staff College, Fort Leavenworth, Kansas. Participates on net with six other staff members under the name "LICPRO". Staffers have extensive experience with terrorism, internal defense and low intensity conflict issues.

JAY WELLS, Captain, Infantry, U.S. Army. Analyst, Center for Army Lessons Learned, Fort Leavenworth, Kansas. Primarily concerned with Combat Maneuver Training Center issues. Experience with Mechanized Infantry, Special Forces and Airborne units.

BUTCH WHITEHEAD, Lieutenant Colonel, Aviation Branch, U.S. Army. Currently a student at the U.S. Army War College, Carlisle, Pennsylvania and conducting research on a critical assessment of U.S. military strategy in the Persian Gulf. Army aviator with research and development experience.

ALLEN WHITLEY, Lieutenant Colonel, Air Defense Artillery, U.S. Army. Currently a student at the U.S. Army War College, Carlisle, Pennsylvania and conducting research on the methodology for selecting War College faculty. Previous experience as an Air Defense Artillery Battalion Commander. Interested in computer operations and teleconferencing.

STEVE WHITWORTH, Major, Armor, U.S. Army. Executive Officer, Reserve Training Battalion, University of Boulder, Boulder, Colorado. Previous experience with Armor Battalion operations. Interested in history, strategy, joint duty personnel issues and organizational effectiveness.

MARK WILKINS, Captain, Military Intelligence, U.S. Army. Currently a student at the University of Florida. Experience in foreign area operations and CEWI battalion functions. Pending assignment to Caracus, Venezuela.

CHRIS WISE, Lieutenant Colonel, Infantry, U.S. Army. Dean of Area Studies, Defense Language Institute, Presidio of Monterey, California. Participated in LEXSYS last year. Background and experience in Infantry operations, training and Joint Staff functions.

RAY YOUNT, Lieutenant Colonel, Military Intelligence Corps, U.S. Army. Currently a student at the U.S. Army War College, Carlisle, Pennsylvania and conducting research on the U.S. military strategy in space. Previous electronic warfare and intelligence operations experience. Planning, Programing, Budgeting and Execution experience at HQDA level.